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## WINTERING SNOWY OWLS FEED ON SEA DUCKS IN THE BELCHER ISLANDS, NUNAVUT, CANADA

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Snowy Owls (*Nyctea scandiaca*) have a broad wintering distribution that covers much of Canada and northern United States (Kerlinger et al. 1985). The owls consistently winter in the northern Great Plains while their movements to the east and west are more irruptive consisting mostly of immature birds (Kerlinger and Lein 1986). Snowy owls have a varied diet of mammals and birds, but usually focus on lemmings (*Lemmus* spp. and *Dicrostonyx* spp.) during the breeding season and other small rodents and birds that are abundant during the non-breeding season (Watson 1957, Boxall and Lein 1982a, Parmelee 1992).

Most research on wintering Snowy Owls has been conducted in the Canadian Prairies (Boxall and Lein 1982a, 1982b, Kerlinger and Lein 1988a, 1988b), but there have been relatively few studies of Snowy Owls wintering further north. The Belcher Islands, Nunavut, Canada (56°00'–57°30'N, 79°30'–80°00'W) are known breeding and wintering areas for Snowy Owls (Todd 1963, Freeman 1970, Manning 1976). While studying the ecology of sea ducks wintering around the Belcher Islands, we also recorded Snowy Owls (Gilchrist and Robertson 2000). Herein, we expand on our observations of Snowy Owls, describing their distribution and their relationship with wintering Common Eiders (*Somateria mollissima*) and Long-tailed Ducks (*Clangula hyemalis*).

### METHODS

Field work was conducted during three separate 3–4 wk periods during the winters of 1998 and 1999 (March 1998, January 1999, March 1999) on the Belcher Islands, southeastern Hudson Bay. Throughout the winter, areas of near-shore, open water are present in the Belcher Islands archipelago. These open-water areas are of two types: (1) small recurring polynyas in areas of strong tidal currents, and (2) water that is adjacent to ice-floe edges and remains free of ice only during offshore winds (Nakashima and Murray 1988, Gilchrist and Robertson 2000).

During each winter, we traveled by snowmobile, with

local Inuit guides, to various open-water areas around the Belcher Islands (Gilchrist and Robertson 2000). Destinations depended mainly on past and present weather conditions, and on information from other Sanikiluaq hunters who reported locations of recent sea duck sightings.

After arriving at each area of open water, we estimated how many individuals of each species were present. If ducks were sighted and were reasonably close to the ice edge (<500 m), we remained at the same site to collect behavioral data and information on the population of birds using the site; otherwise, we moved on to another open-water area. If conditions were suitable at the end of observations, our guides attempted to collect sea ducks. We did not always see Snowy Owls immediately upon arrival as we inspected surrounding ice ridges with spotting scopes or binoculars after observations of sea ducks were completed. Sometimes we saw owls after they flew; therefore, we believe our sightings underestimate the actual number of Snowy Owls present.

Snowy Owl numbers at water bodies were best described by a Poisson distribution (coefficient of dispersion = 1.63), so we used Poisson regressions to examine relationships between duck and Snowy Owl numbers. The data were observational, so we conducted the analysis using a model-selection framework (Burnham and Anderson 1998) rather than a traditional hypothesis-testing framework. In the model-selection framework, candidate models are constructed, and their ability to fit the data, without including too many parameters, is evaluated using Akaike's Information Criterion (AIC). To explain the number of Snowy Owls sighted, we constructed four candidate models. The first model included terms for numbers of Common Eiders and Long-tailed Ducks present, the second only eiders, the third only Long-tailed Ducks, and the last included only an intercept term. As some observations were from the same water body, we included the location of sightings as a repeated measure in the Poisson regression, and used a corrected AIC (termed AIC<sub>C</sub>) that used number of locations rather than number of sightings. Medians, means, and ranges are also presented to describe the data (see Gilchrist and Robertson 2000).

### RESULTS AND DISCUSSION

Snowy Owls were regularly seen at several open-water areas. On 56 trips to 14 different water bodies, Snowy Owls were seen 15 times. The observed number of Snowy

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Table 1. Model fitting results of Poisson regressions, with numbers of ducks as the predictor(s) and number of Snowy Owls as the response. Models with the lowest  $AIC_c$  values indicate the most parsimonious (i.e., best fitting) model. K is the number of parameters, while Deviance is a measure of model fit.

MODEL	K	DEVIANCE	$AIC_c$
Common Eiders +			
Long-tailed Ducks	3	62.78	71.18
Common Eider	2	68.06	73.15
Long-tailed Duck	2	69.91	75.00
Intercept only	1	84.31	86.65

Owls ( $\bar{x} = 0.4$ , range 0–1) was positively related to the observed number of Common Eiders ( $\bar{x} = 1169$ , range = 0–12 500) and to the observed number of Long-tailed Ducks ( $\bar{x} = 55$ , range = 0–700) (Table 1).

On two different occasions we saw a Snowy Owl take a carcass of a Long-tailed Duck directly off the water immediately after the duck was shot by our Inuit guides. On another occasion, when our guides shot a male Common Eider, a Snowy Owl made a few passes over the carcass but did not come close enough to seize it, presumably because we were standing directly at the floe edge trying to retrieve the eider. Our Inuit guides described additional instances where they observed owls taking crippled eiders off the water (Nakashima and Murray 1988). In all cases, the owls appeared from the ice-edge and flew out over the water. Owls often perched on ice ridges piled up at the landfast ice-edge, and appeared to watch sea ducks from there. Owl pellets and what appeared to be raptor-killed carcasses (only breast bone and wings remaining) of both eiders and Long-tailed Ducks were also found at ice perches along the floe edge. To our knowledge, there are no other raptors wintering in the Belcher Islands (Gilchrist and Robertson 2000), although some of these remains may have been left by scavenging Arctic foxes (*Alopex lagopus*) and Common Ravens (*Corvus corax*).

We were able to travel continuously along two of the floe edges. The first was ca. 10 km long, and we saw four owls; the second was ca. 15 km long, and we saw three owls. The owls appeared to be spaced out evenly along these flow edges, at approximately 2–5 km intervals. Snowy Owls wintering in the Prairie Region of Canada form winter territories (Boxall and Lein 1982b), as do Snowy Owls wintering in Massachusetts (D. Holt pers. comm.). It is therefore possible that Snowy Owls form temporary territories along the floe edges that have open water.

Snowy Owls apparently associate with concentrations of Common Eiders and Long-tailed Ducks. Eiders spend considerable time loafing and resting on the ice, especially at night or when currents are strong. Out of water,

eiders may be particularly vulnerable to Snowy Owls and other predators, such as Arctic fox, as they cannot dive to escape (Nakashima and Murray 1988). While Long-tailed Ducks (700–800 g) may be easier prey for Snowy Owls, Common Eiders may be a more important source of food because they are larger (>2000 g) and more abundant in the Belcher Islands. Also, large numbers of Common Eiders (100s–1000s) occasionally starve when open-water areas freeze over (Nakashima and Murray 1988, Gilchrist and Robertson 2000), making the eiders easy prey.

Although Snowy Owls are known to prey primarily on small mammals, they will consume waterbirds when that prey is plentiful. On the coast of southwestern British Columbia, wintering Snowy Owls consumed a wide variety of waterbirds, with Horned Grebes (*Podiceps auritus*) being the most common prey item, followed by Bufflehead (*Bucephala albeola*) (Campbell and MacColl 1978). Although Campbell and MacColl (1978) demonstrated that birds in 400–800 g weight class were preferred, birds as large as White-winged Scoters (*Melanitta fusca*) at 1300 g, Mallards (*Anas platyrhynchos*) at 1100 g, and Glaucous-winged Gulls (*Larus glaucescens*) at 1200 g, were also present in the diet. In Alaska, non-breeding Snowy Owls consumed many Ancient Murrelets (*Synthliboramphus antiquus*), as well as other alcids and ducks (Williams and Frank 1979). Snowy Owls migrating along the St. Lawrence River fed heavily on murrets (*Uria* spp.) (Bent 1938). Portenko (1989) describes that Snowy Owls wintering on St. Lawrence Island, Bering Sea, fed exclusively on wintering ducks, specifically Long-tailed Ducks and King Eiders (*Somateria spectabilis*). Snowy Owls wintering in the Belcher Islands also appear to focus their winter foraging in marine areas where sea ducks are plentiful.

We suggest that Snowy Owls are important members of the avian community wintering in the Belcher Islands. Our observations show that Snowy Owls prey upon abundant wintering sea duck populations and that their distribution and abundance within the region are positively associated with concentrations of sea ducks. Sea ducks have to move around the Belcher Islands archipelago as open-water areas change locations with varying currents and winds. Snowy Owls likely move with the sea ducks, following them around the archipelago and possibly establishing temporary territories. As with the Great Plains of North America (Kerlinger and Lein 1986), the Belcher Islands, and perhaps other areas in the Arctic with recurring open-water bodies and wintering sea ducks, are likely used consistently by Snowy Owls (Portenko 1989).

RESUMEN.—Documentamos la presencia del búho nival (*Nyctea scandiaca*) durante la migración de otoño en las Islas Belcher, Nunavut en 1998–99. En 56 viajes a los sitios de estudio, algunos búhos fueron relacionados con *Somateria mollissima* y con *Clangula hyemalis* presentes en los cuerpos de agua abiertos. Lo búhos fueron observados, capturando en el agua a los patos de cola larga he-

ridos. También fueron detectados en perchas de filos de hielo con restos de patos o con egragopilas cercanas. Las áreas de aguas abiertas de las Islas Belcher y las de las "polynias" recurrentes, así como los bordes de los témpanos de hielo, pueden ser utilizados consistentemente como áreas de destino de la migración de otoño, por el búho nival.

[Traducción de César Márquez]

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